

# (12) UK Patent Application (19) GB (11) 2 193 525 (13) A

(43) Application published 10 Feb 1988

(21) Application No 8714308

(22) Date of filing 18 Jun 1987

(30) Priority data

(31) 8626956

(32) 8 Aug 1986

(33) DE

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E05C 3/16

(52) Domestic classification (Edition J):

E2A 190 411 AG

E2M 11F1 12A 12EX 16 20 25

U1S 1238 E2A E2M

(56) Documents cited

None

(58) Field of search

E2A

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## (54) Door closure for a household appliance

(57) A door closure comprises a housing (1) in which is disposed a spring (2) which acts against a closure lever (5), co-operable with a stationary pin (4) at a housing of an appliance. On opening and closing of the door (21), the pin initiates movement of the closure lever (5) into an opening or closing position. The spring (2) is fastened at a pivot lever (6), which is pivotally mounted (at 17) on the closure housing and which by way of a handle (7) is resettable from the outside of the door can be held in an unlatching position permitting the opening of the door or a latching position preventing opening of the door. As shown the spring (2) acts between an abutment on the pivot lever (6) and an end (13) of a pull lever (14) acting (at 12) on the closure lever (5).

The closure lever (5) is movably guided on the closure housing (1) by a slot (8) and a stationary pin (9). In addition, the closure lever (5), is pivoted at its end (12) to a guide (10) which is pivoted to the housing at its other end (11). An electrical switch (18) actuable by the handle (7) is arranged at the closure housing.

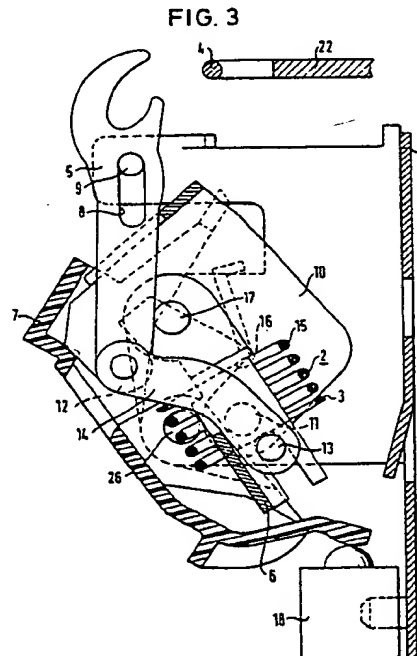
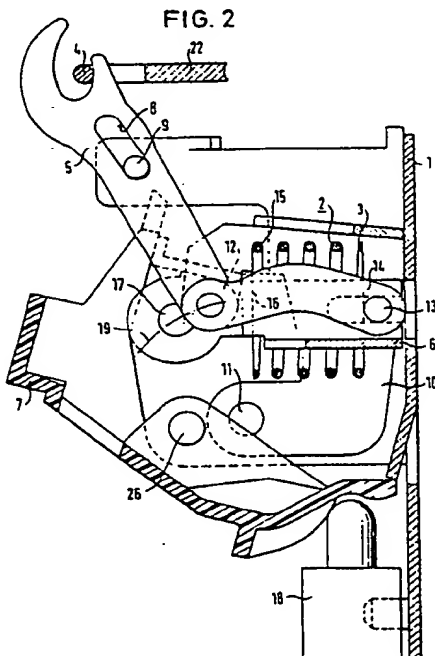


FIG. 1

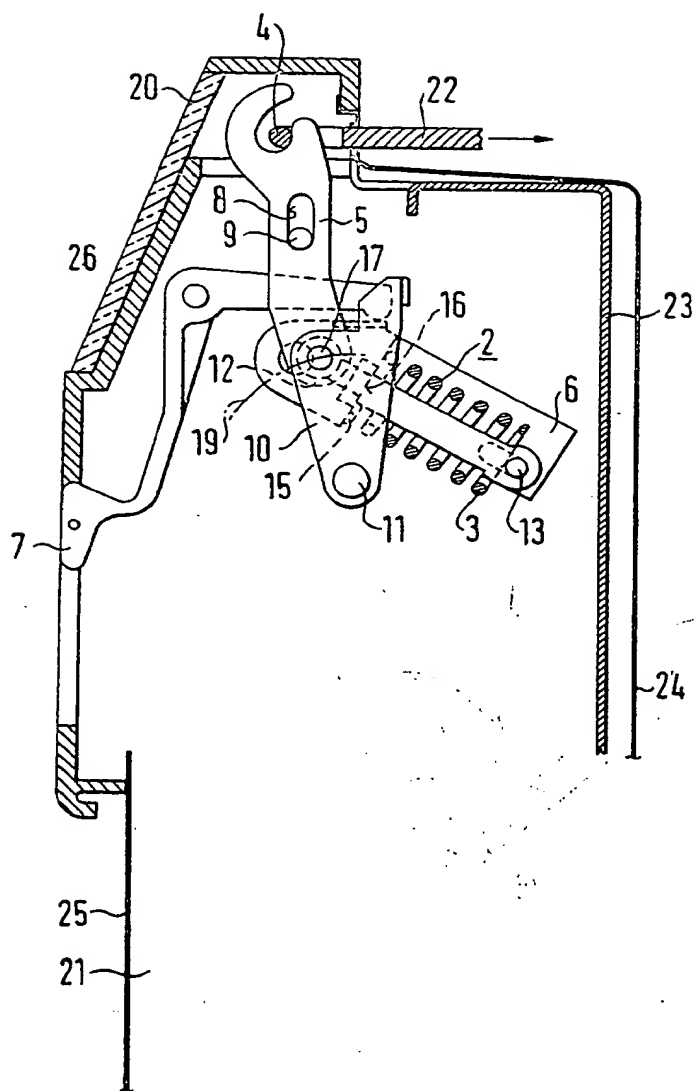
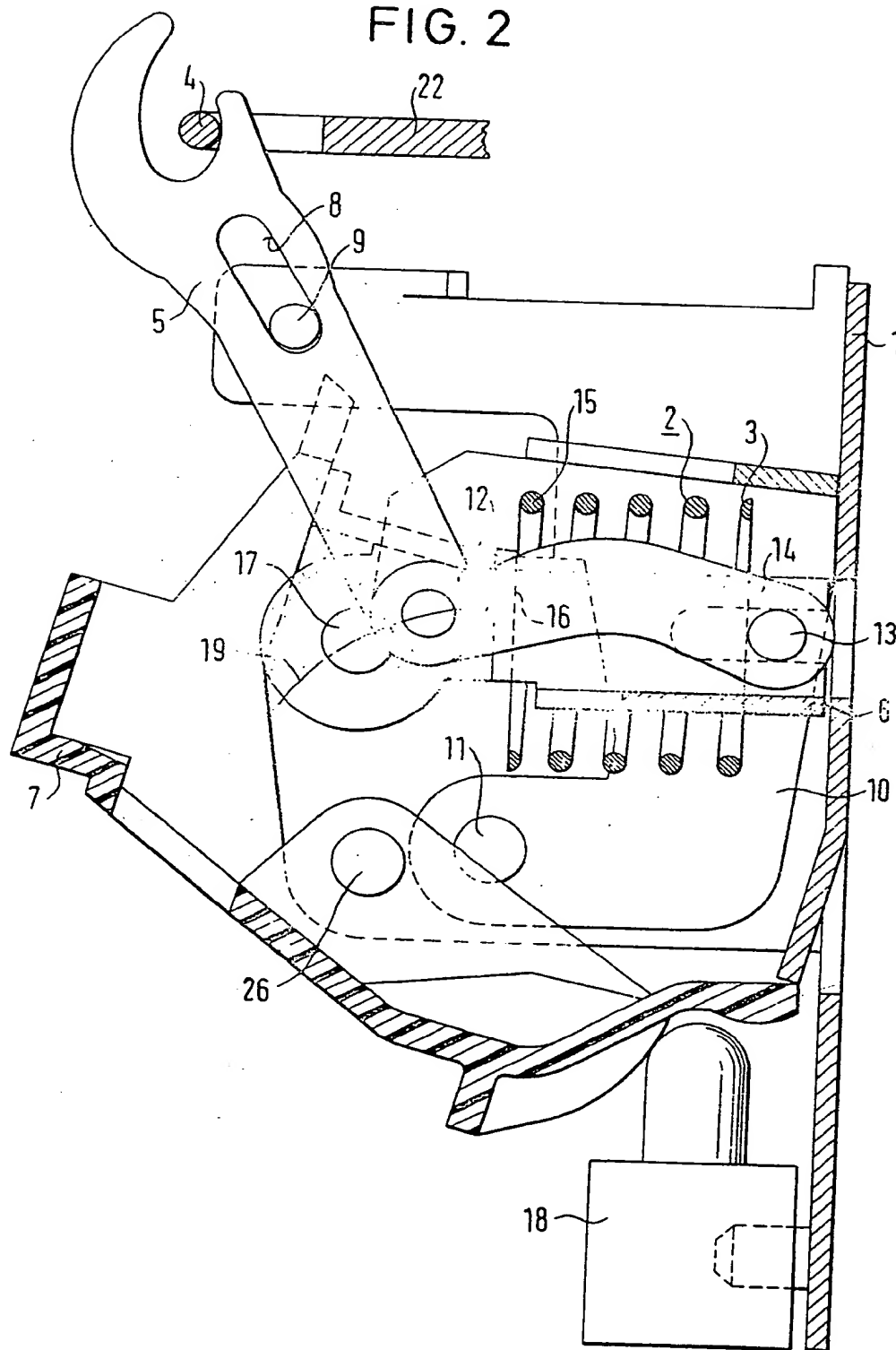


FIG. 2





## SPECIFICATION

## Door closure for a household appliance

- 5 The present invention relates to a door closure for a household appliance.

10 In a known door closure (DE-AS 16 53 945), a spring is arranged in a closure housing and at one end engages a closure lever which can be snapped over and co-operates with a stationary pin arranged at the housing of the appliance. On opening and closing of the door, the pin initiates snapping-over of the closure lever into an opening position and a closing position respectively. The spring is fastened at its other end at a pivot lever, which is mounted at the closure housing and is resettable by way of a handle from the outside of the door selectably into an unlatching position permitting opening of the door and a latching position preventing opening of the door. In order that, on use of such a closure in a front-loading dishwashing machine, a sufficiently large force acts on the door seal in the closed position of the machine door and that the force of the spring need neither be increased nor reduced or overcome for varying the closing force of the closure lever, the bearing point of the spring at the closure lever in the closed position of the closure lever lies in an axis with the bearing of the pivot lever at the closure housing. A securing pin is also arranged at the closure lever and a projection is arranged at the pivot lever, which in the latching position of the pivot lever prevent pivotation of the pivot lever out of its closed position and in the opening position of the closure lever prevent resetting of the pivot lever out of its unlatching position.

40 In this door lock the opening process is enhanced by the handle being drawn upwardly. The snap mechanism of a tear-open type closure is present in principle. The disadvantage of the known door closure lies in its small readjustment range. Due to a steep closing cam, the closure operates optimally only in a very narrow tolerance range of about one millimetre. A minimum change in the door adjustment, for example through displaced assembly of the closure plate, produces a very large change in the lock force. Accordingly, it is necessary to observe, in production, whether the door lock runs out of its optimum range and whether adjustment is required. Even if the door setting after production corresponds to the given specification, there is still the risk that the lock conditions change during use of the appliance, for example through cold flow in plastic material parts, through abrasion, through pollution or through fatigue of the spring and in particular of the rubber door seal. These changes can result in sealing problems or increased opening forces.

65 There is thus a need for a closure preferably

70 with features such as compact construction, provision for interruption of the current circuit of the appliance on actuation of the handle and arrangements whereby opening of the door is possible only at the end abutment of the handle and the door cannot be opened without actuation of the handle. The door closure should preferably be distinguished by a high holding force with good tolerance compensation relative to a door seal and by a small opening as well as a closing force.

75 According to the present invention there is provided a door closure for a household appliance, comprising a housing, a closure lever so co-operable with a stationary pin at such appliance as to be moved into an opening position and a closing position respectively during opening and closing of a door of the appliance, a pivot lever pivotably mounted in the housing and resettable by way of a handle from the outside of such door selectably into an unlatching position permitting opening of the door and a latching position preventing opening of the door, a spring which is arranged in the housing to act on the closure lever and which is fastened at the pivot lever, and an electrical switch arranged at the housing to be actuable by the handle, the closure lever being movably guided at the housing by way of a stationary pin engaged in a slot in the closure lever and being further guided at an end thereof facing the second end of the spring by a guide element pivotable about a pivot axis.

100 In a preferred embodiment of such a door closure, the maximum holding force, desired for a large tolerance compensation, results through the arrangement of the rotational centres and abutments of the door closure as well as of the lever arms. On the other hand, operation of the door closure by means of the handle is at the same time possible with relatively low force. Moreover, the door closure is latched against improper opening. During proper opening, preliminary switching-off of the machine current can take place through initial actuation of the handle, after which the latching of the door closure is freed and the door can be opened. During closing of the door, the clamp or closure lever is pressed with low closing force against the stationary pin of the closure plate. Through the moment acting on the closure lever, a first lever arm is reduced down to zero (dead centre) and, towards the over dead-centre position (end abutment), there results an opposite, second lever arm which constantly increases and heightens the holding force. The door is automatically drawn closed as soon as the door closure has exceeded the dead centre position.

125 In one embodiment the spring is a tension spring and is arranged between said end of the closure lever and a fastening point of the pivot lever. In another embodiment, the spring is a compression spring and acts against such

end of the closure lever, the spring being arranged to bear at one end thereof against a fastening pin of the pivot lever and at the other end thereof against an abutment of the pivot lever, and a pull lever being articulated between said closure lever end and said fastening pin.

Preferably, the levers and guide element are so arranged that, on attempted opening of the door without actuation of the handle, the pivot lever remains in a rest position, said end of the closure lever travels on a circular path about the pivot axis of the guide element and the guide element hits against the pivot lever and holds the closure in the closed setting.

Preferably, also, the levers and guide element are so arranged that, on the opening of the door with actuation of the handle, the handle turns the pivot lever about a pivot axis thereof, a fastening point of the pivot lever wanders towards a dead centre position of a connecting line of the pivot axis of the guide element with said end of the closure lever and the resistance to the door opening force tends towards zero and leads to snapping of the closure lever out of the pin at the appliance.

An embodiment of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic sectional view of a door closure embodying the invention, without closure housing and arranged in the shield box of a door;

Fig. 2 is a sectional view of a door closure embodying the invention, with closure housing and in the closed position; and

Fig. 3 is a view similar to Fig. 3, but with the closure in the open position.

Referring now to the drawings there is shown a door closure constructed as a completely pre-assemblable component and arranged in a closure housing 1, which is disposed below a shield box 20 of the door 21 of a household machine, in particular a front-loading dishwashing machine. The closure housing 1 can be fastened to a metal carrier plate 23 between an inner door skin 24 and an outer metal plate 25. The door closure, which can be constructed to be compact in its external dimensions, possesses a preliminary switching-off device, i.e. the current feed to the household appliance can be interrupted during a first portion of the actuating travel of a handle 7 (grip flap). For this purpose, the door closure is associated with an electrical switch 18, which is actuable by an integrally formed portion of the handle 7. The door closure can be opened only when the handle 7 has been actuated as far as an end abutment. Without actuation of the handle 7, the door cannot be opened. On the other hand, at a certain opening angle of the door, an automatic closing is possible if the door is let go.

force, yet can be opened and closed easily.

The door closure, which co-operates with a closing plate 22 and its stationary cotter pin 4 of the machine housing, comprises a closure lever 5 which is guided by way of a stationary pin 9 engaged in an elongate hole 8. A guide 10, by the end 12 of the closure lever 5, describes a circular path 19 around a bearing point or a rotational centre 11 of the frame. Since the end 12 of the closure lever 5 and the guide 10 are borne each against the other, the lower part of the closure lever 5 follows the same circular path 19.

The second functional part of the door closure comprises a pivot lever 6, the guide 10 and a pull lever 14 and forms a simple snap mechanism. The pull lever 14 is guided on a circular path and movable around the bearing rotational centre 13. In that case, it runs through the dead-centre line between the pin 9, the rotational centre 11 of the guide 10 and the end 12 of the closure lever 5. No effective lever arm is present in the dead-centre position, so that the closing force of the door closure is eliminated. When the dead-centre position has been exceeded, then a lever arm and a turning moment arise, which let the pivot lever 6 tilt around its bearing point 17 as far as an abutment. Arranged in the closure housing 1 is a spring 2, which on the one hand acts against the closure lever 5 and on the other hand is supported on a fastening point 13 of the pivot lever 6. The spring 2 is, according to the illustrated embodiment, constructed as compression spring and acts against the end 12 of the closure lever 5 as well as by the one spring end 3 against the fastening point 13, consisting of a pin, of the pivot lever 6 and by the other spring end 15 against an abutment 16 of the pivot lever 6. For uniting the closing assembly with the closure lever 5 and the guide 10 with the snap mechanism (pivot lever 6, guide 10, pull lever 14 and spring 2), the pull lever is connected through a pin with the closure lever 5. The rotational centre of the handle is designated by 26.

#### CLAIMS

1. A door closure for a household appliance, comprising a housing, a closure lever so co-operable with a stationary pin at such appliance as to be moved into an opening position and a closing position respectively during opening and closing of a door of the appliance, a pivot lever pivotably mounted in the housing and resettable by way of a handle from the outside of such door selectably into an unlatching position permitting opening of the door and a latching position preventing opening of the door, a spring which is arranged in the housing to act on the closure lever and which is fastened at the pivot lever, and an electrical switch arranged at the housing to be actuable by the handle, the closure

lever being movably guided at the housing by way of a stationary pin engaged in a slot in the closure lever and being further guided at an end thereof facing the second end of the  
5 spring by a guide element pivotable about a pivot axis.

2. A door closure as claimed in claim 1, wherein the spring is a tension spring and is arranged between said end of the closure  
10 lever and a fastening point of the pivot lever.

3. A door closure as claimed in claim 1, wherein the spring is a compression spring and acts against such end of the closure lever, the spring being arranged to bear at one  
15 end thereof against a fastening pin of the pivot lever and at the other end thereof against an abutment of the pivot lever, and a pull lever being articulated between said closure lever end and said fastening pin.

4. A door closure as claimed in claim 1, wherein the levers and guide element are so arranged that, on attempted opening of the door without actuation of the handle, the pivot  
20 lever remains in a rest position, said end of the closure lever travels on a circular path about the pivot axis of the guide element and the guide element hits against the pivot lever and holds the closure in the closed setting.

5. A door closure as claimed in claim 4,  
30 wherein the levers and guide element are so arranged that, on the opening of the door with actuation of the handle, the handle turns the pivot lever about a pivot axis thereof, a fastening point of the pivot lever wanders towards a dead centre position of a connecting  
35 line of the pivot axis of the guide element with said end of the closure lever and the resistance to the door opening force tends towards zero and leads to snapping of the  
40 closure lever out of the pin at the appliance.

6. A door closure as claimed in any one of the preceding claims, wherein the handle is mounted in a mounting box of the door.

7. A door closure substantially as hereinbefore described with reference to Fig. 1 of the  
45 accompanying drawings.

8. A door closure substantially as hereinbefore described with reference to Figs. 2 and 3 of the accompanying drawings.

50 9. A household appliance provided with a door closure as claimed in any one of the preceding claims.

Published 1988 at The Patent Office, State House, 66/71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office, Sales Branch, St Mary Cray, Orpington, Kent BR5 3RD. Printed by Burgess & Son (Abingdon) Ltd. Con. 1/87.

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FIG. 1

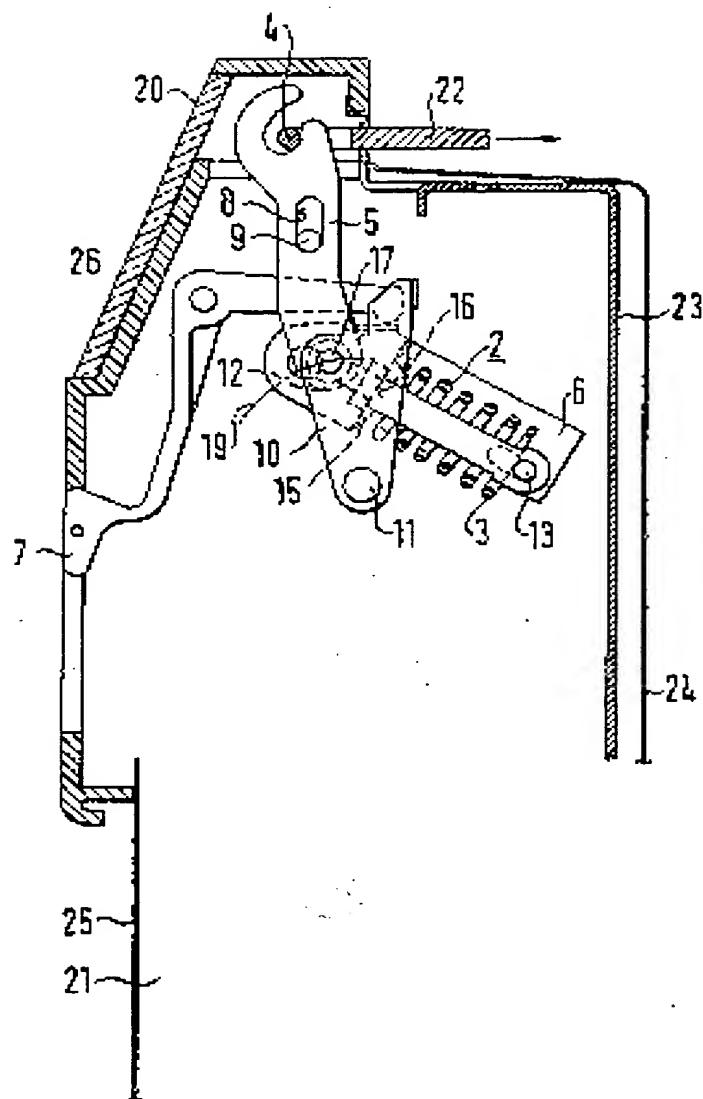


FIG. 2

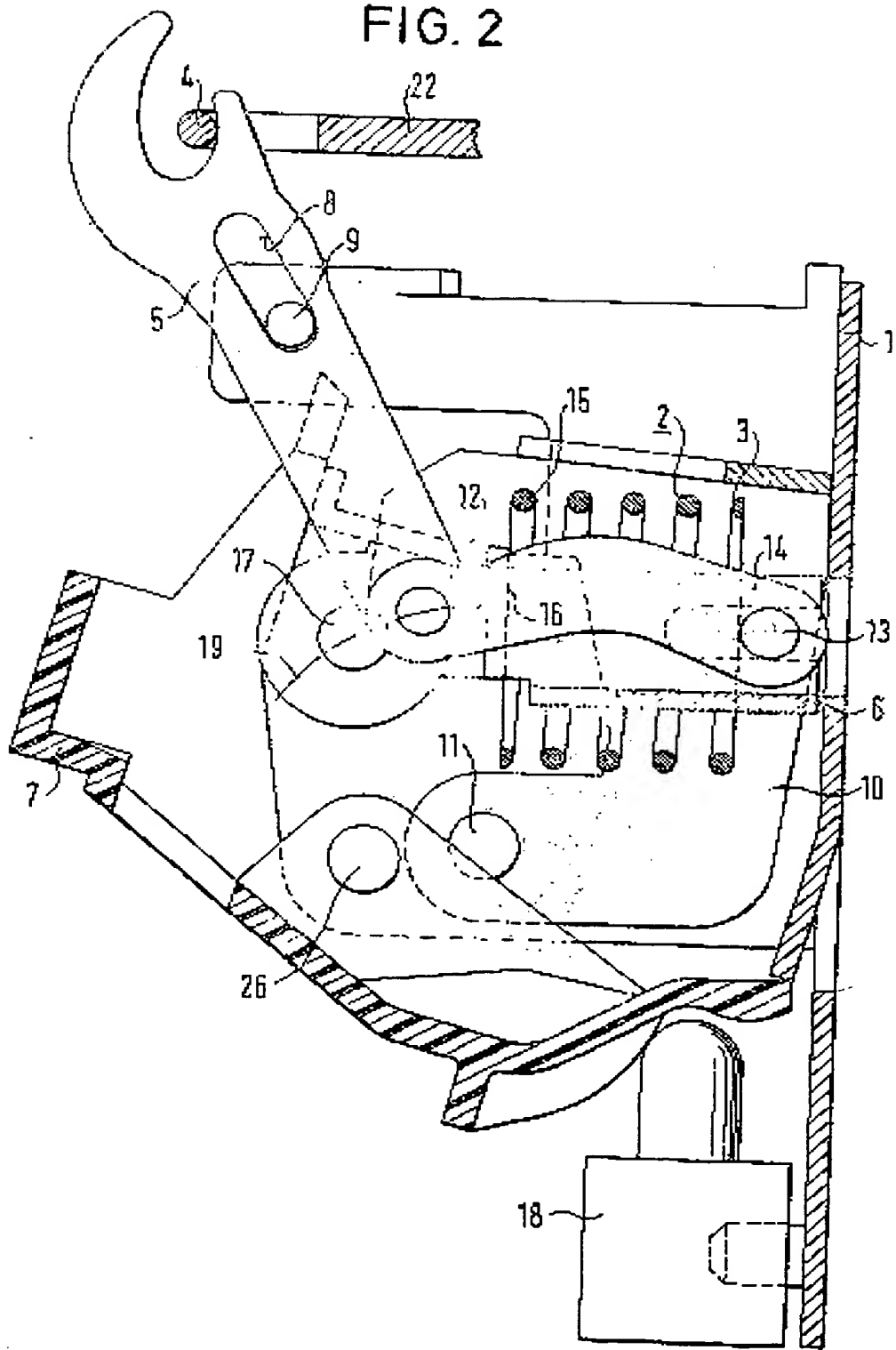


FIG. 3

